IDAHO DEPARTMENT OF HEALTH & WELFARE

Bureau of Environmental Health and Safety, Division of Health **July 2003**

INDOOR AIR CLEANERS AND FILTERS

Introduction

According to the EPA, the main cause of poor indoor air quality in homes is the pollution sources that release gases or particles into the air. Examples of pollutants include dust, pollen, dander, tobacco smoke, chemicals, and gases (combustion products and radon). Air cleaners are devices that attempt to remove such pollutants from the indoor air you breathe.

Should you use an air cleaner?

Neither the EPA nor the Consumer Product Safety Commission endorses the use of air cleaners, so the decision of to use these devices is a personal one. Keep in mind no air cleaner is designed to remove every type of airborne pollutant found in homes.

What types of air cleaners/filters are available?

There are two types of devices -- filters that can be installed in the ducts which are part of central heating and air-conditioning systems in homes, and portable air cleaners that stand alone in a room. Portable units help clean air in a single room, while central air units may improve the air throughout the house.

Specific devices include:
1) Mechanical filters – May be installed in ducts in homes with central units or used in portable devices which contain a fan to force air through the filter. A flat filter is the typical furnace filter installed in central units. They may be effective in collecting larger particles, but are not effective in removing smaller particles that can cause respiratory problems. Pleated or extended filters generally collect a greater amount of small particles without reducing the amount of air flow in your central unit. High Efficiency Particulate Air (HEPA) filters are the most efficient at removing small particles which can be breathed deep into the lungs. HEPA filters are, therefore, effective in removing tobacco smoke, household dust, and pollen. HEPA filters generally are not applied to central heating and cooling units, due to their size and power requirements. If you are looking for a portable air cleaner, however, consider purchasing one that is HEPA-rated.

2) Electronic air cleaners – May be installed in both central units and portable units with fans. Electronic air cleaners use an electrical field to trap charged particles and are usually one of two types:

electrostatic precipitators (ESPs) and charged media filters. ESPs collect particles on a series of flat plates. The less common charged media filters collect particles on fibers in the filter.

3) Ion generators – These devices come in portable units only. Ion generators charge particles that then attach to walls, floors, draperies, etc., or a charged collector.

4) Hybrid devices – Contain two or more of the above devices for removing pollutants.

Note: Both electronic air cleaners and ion generators can produce ozone which is a known lung irritant. Ozone is discussed later in this document.

How do you know what type of air cleaner you need?

If you are trying to remove particles such as dust, smoke, and allergens from the air, medium- and high-efficiency mechanical filters and electronic air cleaners can be effective. If you have odors that are difficult to remove, an activated carbon filter may be effective, especially if the odor is isolated to one room. In most homes, a particle filter is all that is needed.

How effective are air cleaners?

Air cleaning alone cannot adequately remove all pollutants typically found indoors. The first thing that should be attempted is to remove the source of the pollutant from the home. For example, smoke outside or keep pets outside. If that is not possible, the second recommendation is to add outside air indoors through ventilation (using bathroom and kitchen exhaust fans, opening doors and windows, running mechanical ventilation systems). If air quality is still a problem after attending to source control and ventilation, you may want to try an air cleaner.

Air cleaners are only effective at removing particles that become airborne. Therefore, since some pollutants settle out of the air fairly rapidly, air cleaners will not be effective unless they are disturbed or suspended again.

Performance of air cleaners in removing pollutants from indoor air depends not only on the amount of air that flows through the device and the amount of particles it captures, but also on other factors such as:

- Mass of particles entering the device;
- Size and shape of particles;
- How well air leaving the device is mixed with air in the room before and reentering the device; and
- Size of the room.

The federal government has not published guidelines or standards to determine how well low- to medium-efficiency air cleaners work. Standards have been developed, however, by private standard-setting trade associations which may be useful in comparing and choosing an air cleaner. For information on standards for in-duct air cleaners, contact your local HVAC contractor or the Air Conditioning & Refrigeration Institute at (703) 524-8800. For information on standards for portable air cleaners, contact the Association of Home Appliance Manufacturers at (202) 872-5955 or visit their web site at www.cadr.org.

What factors should you consider?

In purchasing air cleaners you should:

- Look at the Clean Air Delivery Rate (CADR). This will tell you the cubic feet of clean air delivered per minute and the efficiency for removing smoke, dust and pollen particles.
- Find an air cleaner that is appropriate for the size of room that you want cleaned. For example, a portable unit used in a room within a large building in which the air flows between several offices would be of little or no value.
- Determine the amount of air handled by the device. In some cases, pollutants may be generated more quickly in the home than a device can remove them.
- Determine how frequently the filter must be changed and how this affects performance.

Note: Before purchasing a filter for your central unit, consult with a HVAC contractor to find out which filter would be the most efficient for your system without reducing the amount of air flow.

What other factors should be considered?

- Ion generators and electronic air cleaners may produce ozone, a known lung irritant. Ozone can be particularly harmful for those who suffer from asthma and other lung diseases.
- The odor of tobacco smoke is largely due to gases in the smoke, rather than particles. You still may smell a tobacco odor when the smoke particles have been removed.
- Some devices scent the air to mask odors, leading you to believe the pollutant has been removed.
- Ion generators, especially those that do not contain a collector, may cause soiling of walls and other surfaces.
- Some portable air cleaners are noisy, even at low speeds.
- Maintenance costs, such as for filters, may be significant. In general, the most effective units are also the most expensive.

Note: The simplest portable air cleaners have a filter that will need to be replaced on a regular basis. Better quality air cleaners will have a HEPA filter, which can be expensive to replace.

How do you ensure adequate performance is achieved?

- Follow manufacturer's directions to ensure the air cleaner works properly.
- Place portable air cleaners near the pollutant source, if one exists.
- Perform routine maintenance as required.
- Ensure that the inlet and outlet are not blocked by walls, furniture or other obstructions.
- Be sure the unit is listed with Underwriters Laboratories (UL) or another recognized independent safety testing laboratory.

Will cleaning the air reduce health effects?

Because of the small number of studies and their small sample sizes, there is not yet sufficient scientific evidence on the health benefits of air cleaner use.

What about air cleaners that produce ozone?

There is a lack of evidence in the scientific literature that would support the effectiveness of ozone at low concentrations in removing pollutants

from indoor air. A study by the EPA demonstrated that ozone is not effective for killing airborne molds and fungi even at high concentrations. At higher concentrations, ozone is a potent lung irritant and can be especially dangerous for people with asthma and other chronic lung diseases, children and the elderly. According to the EPA, there is no difference -- despite some manufacturers' claims -- between outdoor ozone and ozone produced by these devices. The FDA has set a limit of 0.05 ppm (parts per million) of ozone emissions for medical devices.

Ozone generators, negative ion generators and certain other electronic air cleaners that are not listed by FDA or cannot otherwise prove that their ozone emission levels are lower than 0.05 ppm, may produce levels that are unsafe and not recommended for occupied spaces. For these reasons, neither the American Lung Association nor the EPA recommends using air cleaners that produce ozone.

Are there other options available?
Occupants can help reduce the amount of household particles in the home by:

- Removing footwear upon entry;
- Keeping major dust sources (smoking, pets) out of the home;
- Reducing dust collecting surfaces (open shelves, carpets, upholstered furniture);
- Frequently vacuuming the home using an efficient vacuum cleaner; and
- Reducing the amount of particles in the air by keeping windows and door closed as much as possible.

How can you get more information?
If you have questions, contact the Idaho Indoor Environment Program at 1-800-445-8647 or contact us by email at behs@idhw.state.id.us. Additional information can be found on these web sites:

U.S. EPA – "Residential Air Cleaning Devices: A Summary of Available Information"
www.epa.gov/iaq/pubs/residair.html

U.S. EPA – "Ozone Generators Sold as Air Cleaners – An Assessment of Effectiveness and Health Consequences"
www.epa.gov/iaq/pubs/ozonegen.html

U.S. EPA – "Indoor Air Facts No. 7 Residential Air Cleaners"
www.epa.gov/iaq/pubs/airclean.html

American Lung Association – "Residential Indoor Air Cleaning Devices: Types, Effectiveness and Health Impact"
www.lungusa.org/pub/cleaners/air_clean_toc.html

U.S. EPA - The Inside Story: A Guide to IAQ
www.epa.gov/iaq/pubs

U.S. EPA – Should You Have the Ducts in Your Home Cleaned?
www.epa.gov/iaq/pubs/airduct.html

References:
* "Residential Indoor Air Cleaning Devices: Types, Effectiveness and Health Impact," American Lung Association, 2002
* "Residential Air Cleaning Devices: A Summary of Available Information," U.S. Environmental Protection Agency, 1990
* "Residential Air Cleaners," U.S. Environmental Protection Agency, 1990
* "Ozone Generators that are Sold as Air Cleaners: An Assessment of Effectiveness and Health Consequences," U.S. Environmental Protection Agency, Updated March 23, 1999